

## CLAIMS

- 1 1. A method for fast reboot of a computer having an attached disk array and an in-  
2 ternal random access memory (RAM) comprising the steps of:  
3 retaining a copy of in-memory data, from which a operating system kernel is re-  
4 loaded, on a reserved storage location of the RAM;  
5 performing predetermined reboot operations with a boot mechanism; and  
6 reloading the operating system at a location in the RAM based upon the copy of  
7 the operating system retained at the reserved storage location after the step of performing  
8 the predetermined reboot operations.
- 1 2. The method as set forth in claim 1 wherein the boot mechanism is adapted to per-  
2 form predetermined full reboot steps based upon a full reboot instruction from the oper-  
3 ating system, and wherein the predetermined reboot operations omit the predetermined  
4 full reboot steps when the operating system is reloaded from the reserved storage location  
5 based upon a warm reboot instruction so as to perform a less-than-full reboot.
- 1 3. The method as set forth in claim 2 wherein the predetermined full reboot steps  
2 include loading into the memory a copy of on-disk data from which the operating system  
3 kernel is reloaded, and the predetermined full reboot steps further include at least one of  
4 (a) fully clearing of the RAM, including the reserved storage location, and (b) fully test-  
5 ing the RAM.
- 1 4. The method as set forth in claim 3 wherein the predetermined full reboot steps  
2 further include testing at least one of an LCD display chip and a Serial Input/Output  
3 (SIO) chip.
- 1 5. The method as set forth in claim 2 wherein the copy of in-memory data comprises  
2 a compressed image of the operating system kernel adapted to be uncompressed and ex-  
3 tracted to form the operating system at the location in the RAM.

12. The method as set forth in claim 10 wherein the step of providing the warm re-  
boot instruction includes setting a flag in the boot mechanism from a full reboot state to a  
warm reboot state.

1 13. The method as set forth in claim 10 further comprising reverting to the full reboot  
2 if the copy of the data is corrupted.

1 14. A system for performing a fast reboot of a computer having an array of attached  
2 disks and an internal memory comprising:  
3 a boot mechanism that carries out full reboot operations on the file server, the  
4 boot mechanism including a flag adapted to indicate performance by the boot mechanism  
5 of either (a) the full reboot operations or (b) warm reboot operations wherein at least one  
6 of the full reboot operations is skipped.

1 15. The system as set forth in claim 14 wherein the full reboot operations that are  
2 skipped include a full test of the memory, a zeroing of the memory, a shutdown of a  
3 processor of the file server and a loading of data from the array of disks that generates the  
4 operating system kernel at a predetermined kernel location in the memory.

1 16. The system as set forth in claim 15 wherein the memory includes a reserved stor-  
2 age space that stores a copy of data from which the operating system is loaded into the  
3 predetermined location in the memory during the warm reboot operations, the boot  
4 mechanism being adapted to retain uncleared the reserved storage space during the warm  
5 reboot operations, and being adapted to clear the reserved storage space during the full  
6 reboot operations.

1 17. The system as set forth in claim 16 wherein the copy of the data stored in the re-  
2 served storage space is a compressed image of the operating system kernel and the boot  
3 mechanism is adapted to load the compressed image of the operating system kernel from  
4 the reserved storage space into a space in the memory outside the reserved storage space,  
5 and further comprising a boot loader that subsequently uncompresses and extracts the  
6 compressed image of the operating system kernel at the space in the memory outside the  
7 reserved storage space to generate the operating system kernel at the predetermined ker-  
8 nel location in the memory.



4 directing a boot mechanism that carries out the full reboot steps to undergo a  
5 warm reboot;  
6 retaining an uncleared reserved storage space in the RAM so as to store in-  
7 memory data from which the operating system kernel is generated; and  
8 after predetermined warm reboot steps are performed, generating the operating  
9 system kernel from the in-memory data in a portion of the RAM outside the reserved  
10 storage space.

1 23. The method as set forth in claim 22 wherein the step of generating the operating  
2 system kernel includes uncompressing a compressed image of the operating system ker-  
3 nel.

1 24. The method as set forth in claim 23 wherein the step generating further includes  
2 copying the in-memory data to form the compressed image of the operating system ker-  
3 nel at a location within the portion of the RAM outside the reserved storage location.

1 25. The method as set forth in claim 23 wherein the step of generating includes per-  
2 forming an error check on the data and, if the in-memory data is corrupted, reverting to  
3 the full reboot steps.

1 26. The method as set forth in claim 23 wherein the full reboot steps include (a)  
2 clearing the reserved storage space, (b) loading, from the disk array, on-disk data from  
3 which the operating system kernel is generated and (c) copying the on-disk data to the  
4 reserved storage space to thereby store the in-memory data.

1 27. The method as set forth in claim 26 wherein the full reboot steps further comprise  
2 at least one of (a) fully clearing the memory, and (b) performing a full test of the mem-  
3 ory.

1 28. A method for fast reboot of a computer having the random access memory com-  
2 prising the steps of:

3 performing predetermined reboot steps with a boot mechanism; and  
4 reloading an operating system kernel extracted from a stored operating system  
5 kernel image, the operating system kernel image being stored in a reserved location of the  
6 random access memory prior to the step of performing the predetermined reboot steps,  
7 the reserved location remaining uncleared after the step of performing the predetermined  
8 reboot steps.

1 29. A method for rebooting a computer comprising the steps of:  
2 in response to a predetermined reboot command, selectively reloading an operat-  
3 ing system kernel to a memory of the computer from either a first compressed kernel im-  
4 age of the operating system or a second compressed kernel image of the operating sys-  
5 tem, each of the first compressed kernel image and the second compressed kernel image  
6 being located on different non-removable storage media, wherein an access speed for the  
7 first compressed kernel image is quicker than an access speed for the second compressed  
8 kernel image.

1 30. The method as set forth in claim 29 further comprising storing the first com-  
2 pressed kernel image is on a reserved space of the memory that remains uncleared during  
3 a warm reboot process having predetermined warm reboot steps and storing the second  
4 compressed kernel on a disk operatively interconnected to the computer.

1 31. The method as set forth in claim 30 wherein the step of storing the first com-  
2 pressed kernel image includes loading a copy of the second compressed kernel image  
3 onto the reserved space during a full reboot process that includes both full reboot steps  
4 and the predetermined warm reboot steps.

1 32. The method as set forth in claim 31 wherein the full reboot steps include clearing  
2 the memory, including the reserved storage space and testing each of an LCD display  
3 chip and a serial input/output (SIO) chip.

1 33. An operating system for a computer having an operating system kernel stored in a  
2 memory of the computer comprising:  
3 a warm reboot instruction, responsive to a predetermined reboot condition, that  
4 sets an indicator in a boot mechanism of the computer to perform a warm reboot process  
5 that includes predetermined boot steps that are fewer than the boot steps performed by the  
6 boot mechanism in response to a full reboot instruction.

1 34. The operating system as set forth in claim 33 wherein the boot steps of the full  
2 reboot process include mechanisms for fully clearing the memory and reloading a com-  
3 pressed kernel image of the operating system from a disk into the memory.

1 35. The operating system as set forth in claim 34 further comprising a compressed  
2 kernel image located at a reserved storage space in the memory that is remote from the  
3 area controlled by the operating system and that remains uncleared during the warm re-  
4 boot process, the compressed kernel image located at the reserved storage space being  
5 adapted to be accessed to reload the compressed kernel image into the memory during a  
6 warm reboot process.

1 36. The operating system as set forth in claim 33 wherein the warm reboot instruction  
2 is based upon a condition in the computer that requires only the boot steps of the warm  
3 reboot process and that allows the boot steps of the full reboot process to be skipped.

1 37. The operating system as set forth in claim 33 wherein the indicator includes a plu-  
2 rality of warm reboot levels that enable each of the boot steps of the full reboot process to  
3 be selectively performed or skipped.